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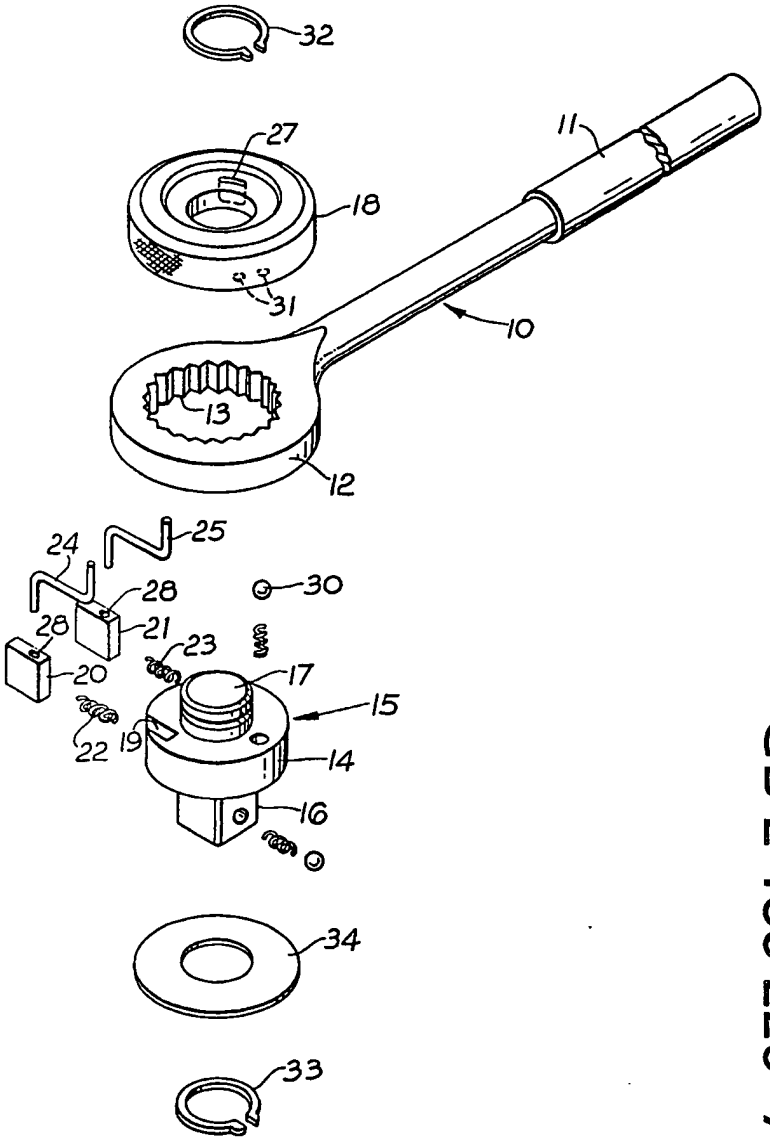
(54) Ratchet wrench

(57) A reversible ratchet wrench comprises a driving member 10 including a lever handle 11 and a relatively rotatable driven member 15 located through a ring portion 12 of member 11 and having a square drive dog 16. Selective ratcheting action in either direction is provided by a pair of pawls 20, 21 located in parallel slots in a body of member 15 and resiliently urged into engagement with internal ratchet teeth 13 of ring portion 12, one or other of said pawls being drawn out of said engagement by means of an annular change-over member 18 located on a stub 17 of member 15 and connected to the pawls by respective links 24, 25. Change-over member 18 is held at one or other position appropriate to the selected direction of drive by a spring loaded ball detent 30 located in the driven member and co-acting with recesses 31 in a radial face of the change-over member, this locating means acting independently of the resilient loading of pawls 20, 21.



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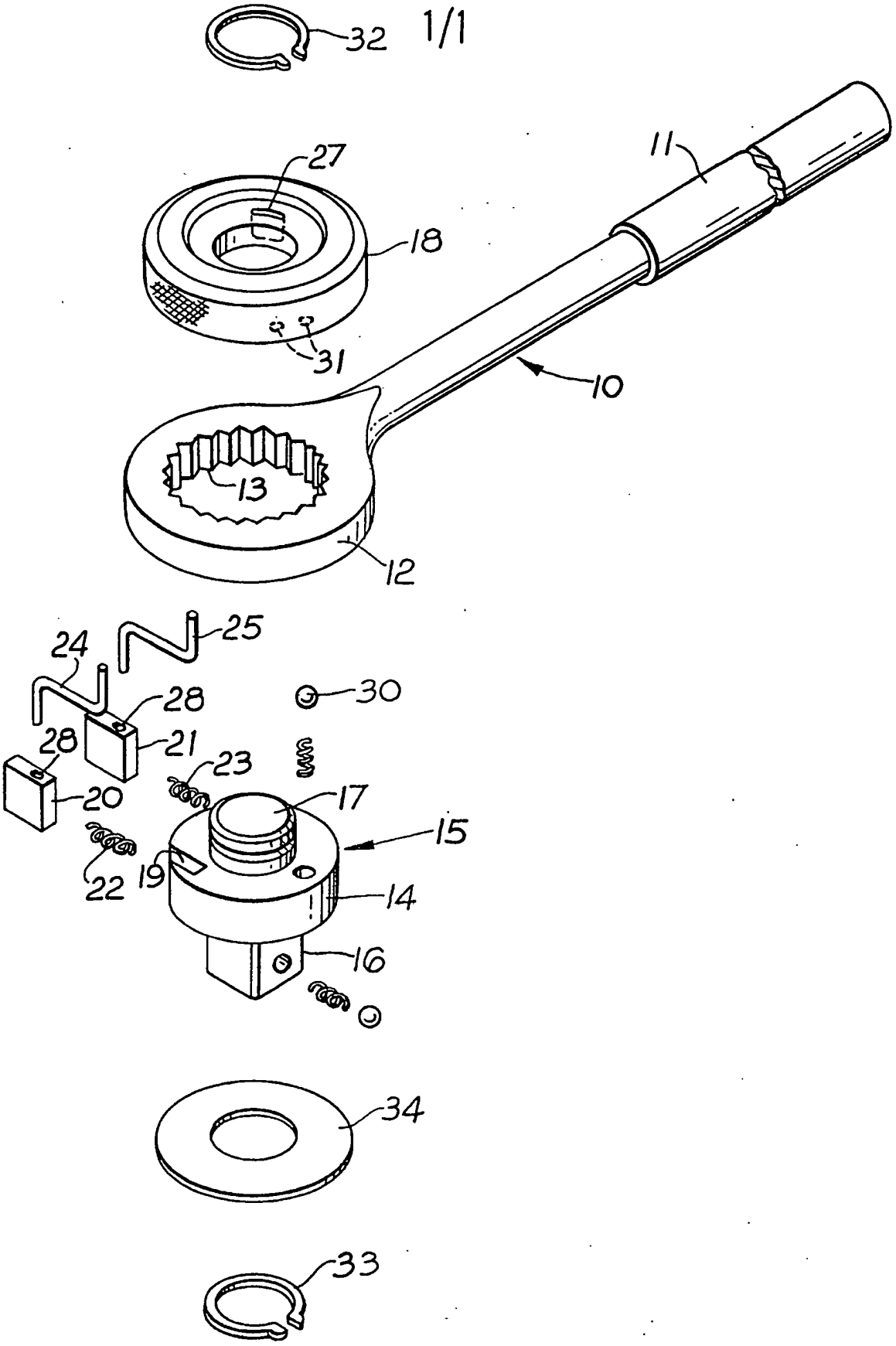
The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.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SPECIFICATION

Ratchet wrench

This invention relates to ratchet wrenches, particularly but not exclusively in the form of hand tools for use with threaded fasteners, e.g. a ratchet socket wrench.

The object of the invention is the provision of a ratchet wrench which is compact, easily and economically manufactured, durable and hard wearing in use, and whose operation is particularly adaptable and convenient for the user.

According to the invention there is provided a ratchet wrench comprising relatively rotatable driving and driven members, ratchet mechanism for transmitting angular movement of the driving member to the driven member in one or other direction of rotation, and reversing means selectively operable to alter the direction of rotation in which drive is so transmitted; wherein said ratchet mechanism comprises a ring of ratchet teeth on one member and pawl means carried on the other member resiliently urged into coacting engagement with side teeth; and wherein said reversing means comprises a changeover member mounted for angular movement relative to said other member between first and second positions about the axis of said relative rotation and connected to the pawl means for displacement of the latter whereby the drive is transmitted in one or other selected direction according to whether the changeover member is at the first or second position, and retaining means resiliently urged into engagement with the changeover member for retaining the latter member at the selected position without the forces acting to provide the latter engagement being communicated to affect the resilient loading of the pawl means.

Preferably the one member having the ring of teeth is the driving member and conveniently comprises a handle for its angular movement by a user, while the driven member conveniently includes a drive formation adapted for engagement with a socket or other tool bit or for direct engagement with a threaded element or other workpiece to be rotated in use.

It is also preferred that the ratchet teeth are internal and in operative surrounding relationship to a body of the driven member locating the pawl means.

Conveniently separate forward and reverse pawls are used each resiliently loaded towards the teeth and each connected by a respective link to the change-over member. The latter may be annular in form and lost motion connection may be provided in the linkage between said member and respective forward and reverse pawls so that one or other of the latter is drawn out of engagement with the ratchet teeth at the respective first and second positions.

The retaining means may be a resiliently loaded ball or other detent urged into engagement with respective recesses in a radial face of either the change-over member or, if carried on the change-over member, a radial face of the said other member to determine the first and second positions.

One embodiment of the invention in the form of a round headed reversible ratchet socket wrench is now more fully described with reference to the accompanying drawing which is an exploded perspective view of the wrench.

The wrench comprises a driving member 10 comprising a lever handle 11 integral with and extending radially from an annular head portion 12 having internal ratchet teeth 13, in this example twenty-four in number to give 15° increments of angular movement (i.e. half the increments of angular positioning provided by use of a standard bi-hexagon sockets). These teeth are symmetrical in form with planar flanks at the angle of 90°.

Operatively located within ring portion 12 is a cylindrical body portion 14 of a relatively rotatable driven member 15. The latter includes an axially extending square section drive dog 16 to which can be coupled, directly or indirectly, standard square drive sockets or other tool bits as required.

The opposite end of member 15 is formed as a cylindrical stub shaft 17 which locates an annular change-over member 18 further described hereafter. Body portion 14 is provided with a pair of parallel tangential slots 19 (one only visible) which locate a pair of forward and reverse pawls 20, 21. The pawls are rectangular blocks and are each urged tangentially outwardly of the body portion 14 by respective compression pawl springs 22, 23 which locate in internal bores in portion 14.

As the envelope of relative revolution of the ratchet teeth 13 intersects the direction of displacement of pawls 20, 21 at 45° each one can be displaced tangentially inwardly under the sliding action of the teeth in one direction of relative rotation but will lock solid to transmit drive in the opposite direction of rotation and it will be observed that substantial forces can be transmitted as the outer end of the pawl is subjected to shear force which extends diagonally across practically its full thickness. This strength is increased by the coarse tooth pitching though finer teeth might be employed in some applications.

Change-over member 18 has a knurled periphery and an outer diameter slightly less than that of head portion 12 which it overlies on the opposite side to the projecting drive dog 16, thus it is readily accessible to the hand of a user and can, if required, be angularly displaced by thumb action while the wrench is held in one hand. Member 18 is connected to the pawls by a pair of cranked wire links 24, 25. One arm of each link engages a respective angularly extending slot 27 (one only visible) in a radially inner part of member 18 so providing a lost motion connection, while the other arm of each link is received in a bore 28 in a rear portion of each pawl 20, 21, these arms extending across the axes of springs 22, 23 so that the pawls are not subjected to tilting or out of line forces when pulled back by the links.

Change-over retaining means for holding change-over member 18 at a selected angular position comprises a spring loaded ball 30 located in a bore in body portion 14 parallel to its axis so as to engage one or other of a pair of angularly spaced recesses

31 in member 18.

The whole assembly is held together by an upper circlip 32 locating in a groove of stub shaft 17 in abutment with an outer face of member 18 and a lower circlip 33 engaging a groove at the inner end of drive dog 16 in abutment with a washer 34 which locates against the lower face of head portion 12.

In use the desired direction of drive is selected by moving member 18 to one or other of the angular positions determined by the retaining means, at which one of the links 24, 25 will be pulled by the end of its associated slot 27 so as to draw the associated pawl 20 or 21 tangentially inwardly away from engagement with the ratchet teeth 13. At this position the link associated with the other pawl will be free to move in its slot 27 so that the latter pawl is urged by its associated pawl spring into ratcheting engagement with the teeth. The change-over movement is small yet positive and the force required to retain member 18 in either position is predetermined by the spring loading of the retaining means. This retaining force or loading is not communicated to and has no effect on the resilient loading of the ratchet pawls.

Thus the strength of the pawl springs 22, 23 can be selected to give a particularly light and responsive rachet action, i.e. minimum torque is necessary to move the driving member 10 in the non-driving direction without movement of the driven member 15.

This is particularly convenient where threaded members have to be rotated in awkward or inaccessible locations and avoids the annoyance of the nut or bolt which is too tight to rotate with fingers alone (or inaccessible to such rotation) but is not tight enough to provide the reaction needed to provide the ratchet action of a wrench.

Another advantage of the above construction is that drive can be transmitted to member 15 in one or other direction of rotation depending on the ratchet setting by rotating change-over member 18 while holding driving member 10 stationary, thus for example, a threaded element can be run down, "finger tight" in an awkward location by such rotation eg by the thumb followed by final tightening using handle 11 as a ratchet lever in the normal way.

CLAIMS (Filed on 3 Jan. 1984)

1. A ratchet wrench comprising relatively rotatable driving and driven members, ratchet mechanism for transmitting angular movement of the driving member to the driven member in one or other direction of rotation, and reversing means selectively operable to alter the direction of rotation in which drive is so transmitted; wherein said ratchet mechanism comprises a ring of ratchet teeth on one member and pawl means carried on the other member resiliently urged into coacting engagement with said teeth; and wherein said reversing means comprises a change-over member mounted for movement relative to said other member between first and second positions and connected to the pawl means for displacement of the latter whereby the drive is transmitted in one or other selected direction according to whether the change-over member is at the first or second position, and retaining means resiliently urged into engagement with the change-over member for retaining the latter member at the selected position without the forces acting to provide the latter engagement being communicated to affect the resilient loading of the pawl means.

2. A wrench as in Claim 1 wherein the one member having the ring of teeth is the driving member.

3. A wrench as in Claim 2 wherein said driving member comprises a handle for its angular movement by a user.

4. A wrench as in any preceding claim wherein the driven member includes a drive formation adapted for releasable engagement with a socket or other tool bit for direct engagement with a threaded element or other workpiece to be rotated in use.

5. A wrench as in any preceding claim wherein said one member has a ring of internal ratchet teeth in operative surrounding relationship to a body of the other member and the pawl means is located by said body.

6. A wrench as in any preceding claim wherein the pawl means comprises separate forward and reverse pawls each resiliently loaded towards the teeth and each connected by a respective link to the change-over member.

7. A wrench as in Claim 6 wherein the pawls are located for movement along respective parallel spaced formations of the other member.

8. A wrench as in Claim 6 or 7 wherein lost motion connection is provided in the linking of the change-over member to each said pawl so that one or the other of the pawls is drawn out of engagement with the ratchet teeth at the respective first and second positions while leaving the remaining pawl free for ratcheting action.

9. A wrench as in any preceding claim wherein the change-over member is mounted for angular movement relative to said other member about the axis of said relative rotation of the driving and driven members.

10. A wrench as in Claim 9 wherein the change-over member is annular and located on a stub formation of said other member.

11. A wrench as in any preceding claim wherein the retaining means comprises a resiliently loaded detent either carried on or co-acting with the change-over member to engage one or other of respective spaced recesses in either the change-over member or the other member respectively, said recesses determining the first and second positions.

12. A wrench as in Claim 11 wherein said detent is located for movement in a direction parallel to the axis of relative rotation between the driving and driven members.

13. A ratchet wrench substantially as hereinbefore described with reference to and as shown in the accompanying drawing.

New claims or amendments to claims filed on 12 April 1984

New or amended claims:-

14. A ratchet wrench comprising relatively rotat-

able driving and driven members, ratchet mechanism for transmitting angular movement of the driving member to the driven member in one or other direction of rotation, and reversing means selectively operable to alter the direction of rotation in which drive is so transmitted; wherein said ratchet mechanism comprises a ring of ratchet teeth on one member and separate forward and reverse pawls carried on the other member each resiliently loaded towards said teeth; and wherein said reversing means comprises a change-over member mounted for angular movement relative to said other member about the axis of relative rotation of the members between first and second positions connected by a respective link to each pawl for displacement of the latter whereby the drive is transmitted in one or other selected direction according to whether the change-over member is at the first or second position, and retaining means resiliently urged into engagement with the change-over member for retaining the latter member at the selected position without the forces acting to provide the latter engagement being communicated to affect the resilient loading of the pawls.

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